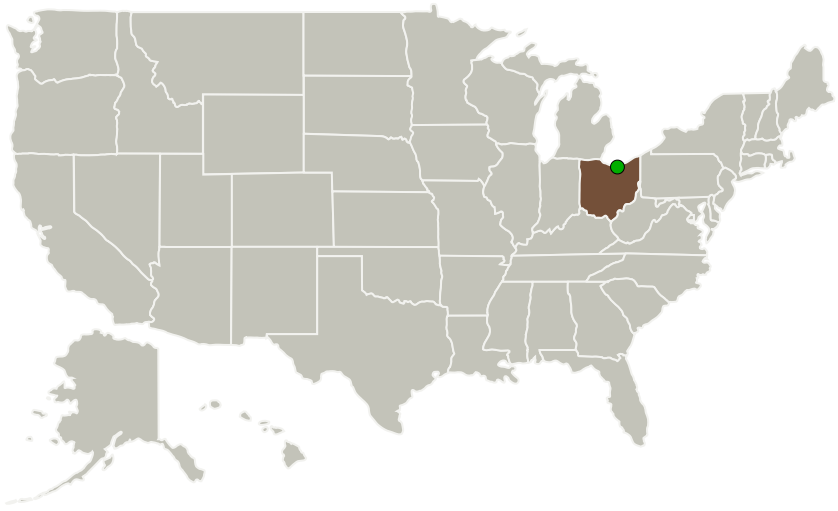
# Wide Temperature, High Voltage and Energy Density Capacitors for Aerospace Exploration, Phase I

Completed Technology Project (2015 - 2015)

## Project Introduction

NASA requires advanced power electronic and energy storage devices that can work at various temperature (-100 degree Celsius to 400 degree Celsius) and high operating voltage with high energy and power density where traditional power and energy storage device cannot be applied. The current state-of-the-art of the capacitor suffers from temperature reliability, especially at high temperature, as well as low-energy density, making them bulky and costly. Power systems for NASA mission must be operated efficiently at high temperatures to eliminate the need for on board cooling systems. The high performance capacitor (temperature reliability and high energy density) will save space, reduce weight, and improve reliability. The proposed Phase I SBIR program will demonstrate Powdermet Inc's ability to produce an advanced nanocomposite capacitor can be applied in harsh and extreme environment as required by NASA aerospace exploration. This novel capacitor will feature as wide operating temperature (-100 degree Celsius to 400 degree Celsius), high operating voltage (>kilovolt) and high-energy density (>4 J/cc) and high powder density (>MW/cc) as well as operating in radiation environment.

## Primary U.S. Work Locations and Key Partners



## Table of Contents



## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Powdermet, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

*Continued on following page.*

**Small Business Innovation Research/Small Business Tech Transfer**

# Wide Temperature, High Voltage and Energy Density Capacitors for Aerospace Exploration, Phase I

Completed Technology Project (2015 - 2015)

| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| Powdermet, Inc. | Lead Organization | Industry | Euclid, Ohio |
| Glenn Research Center(GRC) | Supporting Organization | NASA Center | Cleveland, Ohio |

| Primary U.S. Work Locations |
|---|
| Ohio |

## Project Transitions

**June 2015:** Project Start

**December 2015:** Closed out

**Closeout Summary:** Wide Temperature, High Voltage and Energy Density Capa citors for Aerospace Exploration, Phase I Project Image

**Closeout Documentation:**

- Final Summary Chart Image*(https://techport.nasa.gov/file/139435)*

## Images

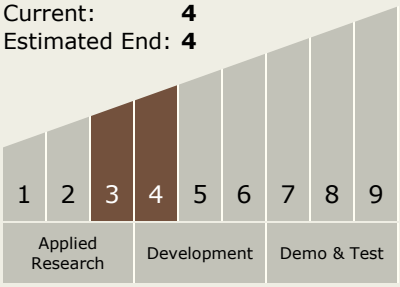
**Briefing Chart Image**
Wide Temperature, High Voltage and Energy Density Capacitors for Aerospace Exploration, Phase I
*(https://techport.nasa.gov/image/126047)*

## Project Management *(cont.)*

**Principal Investigator:**
Haixiong Tang

## Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**




## Technology Areas

**Primary:**

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution
    - TX03.3.3 Electrical Power Conversion and Regulation

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System